habits of *Bacillus mesentericus,* which, in its various strains, is responsible for ropy bread, are already well known to bacteriologists, and, empirically at least, to all the better informed among practical bakers. There is no reason to doubt that with the increased knowledge now being acquired any outbreaks of rope will in the future be easily controlled. That the presence in the loaf of cereals other than wheat can be directly harmful is most unlikely. A favorable effect should indeed be seen in a somewhat improved balance in the protein supplied. Maize, it is true, is said to be badly tolerated by certain individuals, though such cases must be rare. It is also stated that the starch of maize is not fully gelatinized when it is cooked in admixture with wheat under conditions suitable for the production of an all-wheat loaf.

These and other points will doubtless receive the attention of the investigating committee. Its most important task, however, will be to decide, by a thorough sifting of the evidence, the more general question as to whether the war bread is, as a matter of fact, producing any ill effects at all upon the public health. The public will be glad to know that the food controller is in possession of the facts.

Meanwhile, since it is of the utmost importance to the nation that a full supply of bread shall be maintained, while the amount of wheat available is not sufficient for the purpose, we are glad to observe that the medical press is urging the profession to see that the privilege of obtaining high-grade wheat flour for cases supposed to have suffered from the war bread is at any rate not abused.—*Nature.*

SCIENTIFIC BOOKS

The Human Worth of Rigorous Thinking. Essays and Addresses. By Cassius J. Keyser, Ph.D., LL.D., Adrain Professor of Mathematics, Columbia University. The Columbia University Press. 1916. Pp. vi + 314.

Six of the fifteen chapters of this volume appeared in Science during recent years,[1] while the remaining nine chapters, together with reprints of some of the six which had first appeared in Science, were published in various other periodicals or by the Columbia University Press. Hence the volume contains nothing new. Its value is due to the convenient form in which these inspiring essays and addresses are here presented. Unfortunately it contains no index and no table of contents besides the chapter or essay headings.

The title of the volume is the same as that of the initial essay, but some of the other essays contained therein could appropriately have appeared under the same heading, while the remaining ones represent somewhat more special developments along the same general line. Hence the title indicates truthfully the subject-matter of the entire collection. The volume might appropriately have appeared also with the following title: Inspiring thoughts relating to the history, bearing and educational value of mathematics with emphasis on the philosophical elements.

The pre-eminent ability of Professor Keyser along the line of presenting the fundamental elements of abstruse subjects in an elegant and popular manner is well known. His style appeals perhaps more strongly to non-mathematicians than to the majority of the mathematicians, who are often so exclusively interested in technical mathematical questions as to be but little concerned with elegance of language and the philosophical question of human worth. Teachers of mathematics should, however, bear in mind that to many of their students technical mathematical questions have little charm, and that some of these students could doubtless be reached by the more subtle but no less real historical and philosophical questions connected with their subjects.

Hence the volume before us can be highly recommended for the prospective teachers of mathematics, as well as for those who are interested in the general cultural values of various scientific subjects. The professional mathematician will, however, also find therein much that is presented from a somewhat new

[1] On page 220 it is stated that Chapter XII., on the "Principia Mathematica," had been printed in Vol. XXV. of Science. It actually had appeared in Vol. XXXV., 1912, and Vol. XXXVII., 1913.

point of view and that throws new light on the philosophical questions which permeate the various mathematical developments. Among the chapters which might appeal especially to such readers we may mention those bearing the following headings: "The axiom of infinity," "Mathematical productivity in the United States," and "Concerning multiple interpretations of postulate systems and the 'existence' of hyperspace."

In Chapter IX. Professor Keyser discusses "Graduate mathematical instruction for graduate students not intending to become mathematicians," arguing that such courses need not presuppose a first course in calculus, but could be based upon the mathematical preparation gained in a year of collegiate study. He would begin such a course "with an exposition of the nature and function of postulate systems and of the great rôle such systems have always played in the science, especially in the illustrious period of Greek mathematics and even more consciously and elaborately in our own time."

The headings of the nine chapters which have not been mentioned in what precedes are as follows: "The human significance of mathematics," "The humanization of the teaching of mathematics," "The walls of the world; or concerning the figure and the dimensions of the universe of space," "Mathematical emancipation; dimensionality and hyperspace," "The universe and beyond; the existence of the hypercosmic," "The permanent basis of a liberal education," "The source and function of a university," "Research in American universities," and "Mathematics."

Some of these titles are the subjects of addresses delivered by Professor Keyser before large audiences, and many of those who recall his stimulating language will doubtless welcome the opportunity to secure a collection covering such a wide scope of interests which are common to all, but which should appeal especially to those devoted to the borderland between philosophy and mathematics. One finds here a mixture of the most modern theories and the emotional descriptions of past generations, a charming flow of language illuminating most recent advances and, above all, an inspiring tableland of thought which is easily accessible to all but which is closely related with fundamental questions of education.

The mathematicians, as a class, are perhaps too much inclined to put off the historic, philosophic and didactic questions for later consideration, following the example of the great mathematical encyclopedias which are in course of publication. As a result the majority of them become so engrossed in the technical developments of their subjects as to find little time for the postponed questions of the most fundamental importance—a fate which seemed to threaten the encyclopedias just mentioned. A work in which some of these fundamental questions are handled in an attractive manner is therefore a valuable and timely addition to the mathematical literature.

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EQUATIONS AS STATEMENTS ABOUT THINGS

IN the teaching of elementary physics and mathematics, much trouble is often caused by the fact that students who can readily solve an equation given them are unable to formulate in mathematical terms the data occurring in a practical problem. The purpose of this paper is to report briefly the results of several years' experience with a plan designed to remove as much as possible of this trouble by making the equations show more readily their meanings as shorthand statements of the facts. While there is probably nothing about these ideas that has not been suggested before, such suggestions, when applied at all to teaching, seem to have been rather vague and incomplete, or else applied only to one branch of the subject. In this case the plan to be outlined has been used in a general course of physics and in a course in mechanics, with results much more satisfactory than those obtained by the ordinary method.

To illustrate the difference between the old plan and the new, let us consider a single equation, the falling body law

$$s = \tfrac{1}{2} g t^2.$$